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WHAT IS CLAIMED IS:

- 1 1. A brake system for a vehicle, comprising:
 - 2 a first brake system that mechanically applies a
 - 3 braking force to wheels according to a master cylinder
 - 4 hydraulic pressure outputted from a master cylinder which
 - 5 receives a brake manipulation force of a driver; and
 - 6 a second brake system that applies a braking force
 - 7 to other wheels according to at least a braking state of
 - 8 the first brake system.
- 1 2. The brake system as claimed in claim 1, wherein the
- 2 brake manipulation force is inputted through a booster to
- 3 the master cylinder.
- 1 3. The brake system as claimed in claim 1, wherein the
- 2 braking state of the first brake system includes the
- 3 brake manipulation force generated by the driver.
- 1 4. The brake system as claimed in claim 1, wherein the
- 2 braking state of the first brake system includes a
- 3 hydraulic pressure at a position in the first brake
- 4 system.
- 1 5. The brake system as claimed in claim 1, wherein the
- 2 master cylinder is a tandem master cylinder, and the
- 3 first brake system is constructed by two independent
- 4 systems which connect two master cylinder hydraulic
- 5 pressure outlets of the tandem master cylinder and two
- 6 brake units for two wheels, respectively.
- 1 6. The brake system as claimed in claim 5, wherein the
- 2 braking state of the first brake system includes

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3 hydraulic pressures at portions of the respective
4 independent circuits of the first brake system.

1 7. The brake system as claimed in claim 1, further
2 comprising:

3 a first braking force calculating section that
4 calculates the braking force of the first brake system
5 from the braking state of the first brake system;

6 a demand deceleration calculating section that
7 calculates a vehicle demand deceleration from the braking
8 state of the first brake system;

9 a second braking force calculating section that
10 calculates a target braking force of the second brake
11 system so that the target braking force achieves the
12 vehicle demand deceleration in coordination with the
13 braking force of the first brake system; and

14 a second brake system controlling section which
15 controls the second brake system so as to generate the
16 target braking force.

1 8. The brake system as claimed in claim 1, wherein a
2 regenerative brake apparatus for applying a braking force
3 by converting rotational energy of wheels into electric
4 energy and by storing the electric energy in a battery is
5 adapted to wheels which receives the braking force from
6 one of the first brake system and the second brake system.

1 9. The brake system as claimed in claim 8, further
2 comprising:

3 a first braking force calculating section that
4 calculates the braking force of the first brake system
5 from a braking state of the first brake system;

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6 a demand deceleration calculating section that
7 calculates a vehicle demand deceleration from the braking
8 state of the first brake system;

9 a second braking force and regenerative braking
10 force calculating section that calculates a target
11 braking force of the second brake system and a
12 regenerative braking force of the regenerative brake
13 apparatus from the braking force of the first brake
14 system and the vehicle demand deceleration so that the
15 vehicle demand deceleration is achieved by the braking
16 force of the first brake system, the target braking force
17 and the regenerative braking force;

18 a second brake system controlling section that
19 controls the second brake system so as to generate the
20 target braking force; and

21 a regenerative brake apparatus controlling section
22 that controls the regenerative brake apparatus so as to
23 generate the regenerative brake.

1 10. The brake system as claimed in claim 8, further
2 comprising:

3 a first braking force calculating section that
4 calculates the braking force of the first brake system
5 from the braking state of the first brake system;

6 a demand deceleration calculating section that
7 calculates a vehicle demand deceleration from the braking
8 state of the first brake system;

9 a target braking force and regenerative braking
10 force calculating section that calculates a target
11 braking force of the second brake system and a
12 regenerative braking force of the regenerative brake
13 apparatus from the braking force of the first brake

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14 system and the vehicle demand deceleration so that the
15 vehicle demand deceleration is achieved by the braking
16 force of the first brake system, the target braking force
17 and the regenerative braking force;

18 a target braking force and regenerative braking
19 force correcting section that obtains a corrected target
20 braking force and a corrected regenerative braking force
21 by correcting the target braking force and the
22 regenerative braking force so that a braking force
23 distribution to a front axle and a rear axle of the
24 vehicle does not generate a rear wheel lock prior to a
25 front wheel lock;

26 a second brake system controlling section that
27 controls the second brake system so as to generate the
28 corrected target braking force; and

29 a regenerative brake apparatus controlling section
30 that controls the regenerative brake apparatus so as to
31 generate the corrected regenerative brake.

1 11. The brake system as claimed in claim 8, further
2 comprising:

3 a front axle braking force increasing device that is
4 capable of increasing the braking force of a front axle
5 independent from the first brake system;

6 a first braking force calculating section that
7 calculates the braking force of the first brake system
8 from the braking state of the first brake system;

9 a demand deceleration calculating section that
10 calculates a vehicle demand deceleration from the braking
11 state of the first brake system;

12 a target braking force and regenerative braking
13 force calculating section that calculates a target

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14 braking force of the second brake system and a
15 regenerative braking force of the regenerative brake
16 apparatus from the braking force of the first brake
17 system and the vehicle demand deceleration so that the
18 vehicle demand deceleration is achieved by the braking
19 force of the first brake system, the target braking force
20 and the regenerative braking force;

21 a corrected braking force and increased quantity
22 calculating section that obtains a corrected target
23 braking force, a corrected regenerative braking force and
24 a front axle braking force increasing quantity by
25 correcting the target braking force and the regenerative
26 braking force so that the sum of the braking force of the
27 first brake system, the corrected target braking force,
28 the corrected generating braking force and the front axle
29 braking force increasing quantity maintained at a value
30 corresponding to the vehicle demand deceleration and so
31 that a braking force distribution to a front axle and a
32 rear axle of the vehicle does not generate a rear wheel
33 lock prior to a front wheel lock;

34 a second brake system controlling section that
35 controls the second brake system so as to generate the
36 corrected target braking force;

37 a regenerative brake apparatus controlling section
38 that controls the regenerative brake apparatus so as to
39 generate the corrected regenerative brake; and

40 a front axle braking force increasing device
41 controlling section that controls the front axle braking
42 force increasing section so as to generate the front axle
43 braking force increasing quantity.

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1 12. The brake system as claimed in claim 11, wherein
2 when a rear wheel slip preventing apparatus for
3 preventing a braking slip of rear wheels is operating,
4 the front axle braking force increasing device increase a
5 front axle braking force by a rear wheel braking force
6 decreasing quantity generated by a slip preventing
7 operation of a rear wheel slip preventing apparatus.

1 13. The brake system as claimed in claim 10, wherein
2 front two wheels of the vehicle receive the braking force
3 of the first brake system, rear two wheels of the vehicle
4 receives the target braking force of the second brake
5 system, and the regenerative braking force is increased
6 by decreasing the braking force of the first brake system
7 applied to the front wheels so as to be smaller than the
8 braking force of the second brake system applied to the
9 rear wheels.

1 14. The brake system as claimed in claim 8, wherein the
2 regenerative brake apparatus is adapted to rear two
3 wheels.

1 15. The brake system as claimed in claim 1, wherein the
2 first brake system comprises a first pressure increasing
3 and decreasing valve through which a first brake
4 hydraulic pressure of the first brake system is
5 controlled, and the second brake system comprises a
6 second pressure increasing and decreasing valve through
7 which a second brake hydraulic pressure of the second
8 brake system is controlled according to at least a
9 detection result of a braking state of the first brake
10 system,

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11 wherein the brake system further comprises a
12 pressure source selector valve which is disposed between
13 a circuit connecting the master cylinder of the first
14 brake system and the first pressure increasing valve and
15 a circuit connecting another pressure source of the
16 second brake system and the second pressure increasing
17 and decreasing valve, the pressure source selector valve
18 being normally closed, the pressure source selector valve
19 being opened so as to employ the another pressure source
20 of the second brake system as a pressure source of the
21 first brake system.

1 16. The brake system as claimed in claim 15, wherein a
2 master cut valve is disposed at a portion near the master
3 cylinder in the circuit connecting the master cylinder of
4 the first brake system and the first pressure increasing
5 and decreasing valve.

1 17. The brake system as claimed in claim 15, wherein a
2 fail safe valve, which is closed when the pressure source
3 of the second brake system is put in a disabled state, is
4 disposed between the pressure source of the second brake
5 system and the second pressure increasing and decreasing
6 valve, and the pressure source selector valve is closed
7 when the pressure source of the second brake system is
8 put in the disabled state.

1 18. The brake system as claimed in claim 15, wherein the
2 second brake system is constructed by two independent
3 circuits which independently comprise pressure sources,
4 respectively.

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1 19. The brake system as claimed in claim 15, further
2 comprising a drain cut valve which is disposed in a drain
3 circuit for a pressure decreasing valve of the pressure
4 increasing and decreasing valves for the first brake
5 system and the second brake system.

1 20. The brake system as claimed in claim 15, further
2 comprising a discharge block valve which is disposed in a
3 drain circuit for a pressure decreasing valve of the
4 pressure increasing and decreasing valves for the first
5 brake system and the second brake system.

1 21. The brake system as claimed in claim 20, further
2 comprising an accumulator which is connected to the drain
3 circuit upstream of the discharge block valve, the
4 accumulator storing the brake fluid discharged from the
5 master cylinder when the discharge block valve is closed.

1 22. The brake system as claimed in claim 20, further
2 comprising a reservoir which is connected to the drain
3 circuit downstream of the discharge block valve, another
4 pressure source which is connected to the drain circuit
5 upstream of the discharge block valve so that the brake
6 fluid is supplied to the another pressure source from the
7 drain circuit, and a check valve which is disposed in the
8 drain circuit so as to be disposed in parallel with the
9 discharge block valve.

1 23. A method of controlling a brake system of a vehicle,
2 comprising;
3 mechanically applying a first braking force to
4 wheels according to a master cylinder hydraulic pressure

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5 outputted from a master cylinder which receives a brake
6 manipulation force of a driver; and
7 applying a second braking force to other wheels
8 according to at least a braking state of a brake system
9 of generating the first braking force.

1 24. A brake system for a vehicle, comprising:
2 first braking means for mechanically applying a
3 braking force to wheels according to a master cylinder
4 hydraulic pressure outputted from a master cylinder which
5 receives a brake manipulation force of a driver; and
6 second braking means for applying a braking force to
7 other wheels according to at least a braking state of the
8 first braking means.